TRANSLATION

DE 101 57 186 C1

DESCRIPTION

[0001] The invention relates to a vacuum coating system for coating strip material in process chambers, in which, in a first evacuable reel chamber, an uncoiling device, with an inserted uncoiler for the strip material to be coated, is arranged in a first roller mill, and where in a second evacuable reel chamber, a cooling device with a removable cooler for the coated material is arranged in a second roller mill. The strip material to be coated runs between the reel chambers through an evacuable process chamber, wherein a process roller mill, with guide devices for the strip material and a cooling roll, is arranged in each process chamber, above the surface of which cooling roll is arranged at least one magnetron sputter source.

[0002] DE 197 35 603 C1 discloses vacuum coating systems for strip materials consisting of two process chambers. In each process chamber there is a roller mill in which are mounted deflector rolls, strip tension measuring rolls and a cooling roll. Each roller mill is designed so that it can be adjusted horizontally and vertically so that can be adjusted relative to each other, thus preventing folding of the strip material.

[0003] The uncoiler and coiler are located in reel chambers. The material to be coated is uncoiled by the uncoiler in the first reel chamber, fed to the coating process, then coiled in the second reel chamber. Magnetron sputter sources, which are arranged so that they can be adjusted horizontally to each cooling roll, so that it can be adjusted in parallax fashion, are used for coating the strip material.

[0004] The process chambers and reel chambers are separated from each other, in terms of vacuum, by belt valves so that work can be carried out with different gases and different

pressures. The strip material to be coated is conveyed through the belt valves.

[0005] As the foil thicknesses decrease, the precision of adjustability of the roller mills, ranging from approx. 0.1 - 0.2 mm, is no longer sufficient. In particular, it has been shown that despite accurate adjustment of the roller mills, which is carried out regularly under atmospheric conditions, the substrate material is still incorrectly guided in the process.

[0006] The object of the invention is therefore to increase the precision in terms of the parallelism of all the rolls used in the system.

[0007] According to the invention the object is achieved, in a vacuum coating system of the type just mentioned, in that the roller mill for the uncoiler is secured at a first fastening point in the first reel chamber, the process roller mill is secured at a second and third fastening point in the process chamber, and the roller mill for the coiler is secured at a fourth fastening point in the second reel chamber. When the system is in operation the pressure difference between a reel chamber and the process chamber is a maximum of 50 Pa.

[0008] Here a fastening point need not necessarily be understood to mean a punctiform fastening point, but instead fastening may be carried out at fastening that also takes the form of a contact surface or the like.

[0009] Deformations during the required evacuation of the reel chambers and the process chamber, at least in the region of the fastening point, are avoided by the invention. Consequently deviations from the adjustment of the roller mills carried out under atmospheric pressure are also avoided.

[0010] In a particularly advantageous embodiment of the invention provision is made for the first and second fastening point to lie on both sides of a common fastening wall.

[0011] In a further advantageous embodiment of the invention provision is made for the third and fourth fastening points to lie on both sides of a common fastening wall.

[0012] Common fastening walls offer the advantage that the adjacent reference points are mechanically coupled to each other so that almost any geometric deviation before and after the adjustment can be avoided.

[0013] In a further embodiment of the invention provision is made for the first fastening point in the first reel chamber to lie on a first separate fastening wall, and for the second fastening point to lie in the process chamber on a second separate fastening wall.

[0014] In a further embodiment of the invention provision is made for the third fastening point to lie in the process chamber on a third separate fastening wall, and for the fourth fastening point to lie in the second reel chamber on a fourth separate fastening wall.

[0015] Separate fastening walls may be used if the individual components, such as reel chambers or process chamber, and manufactured and are to be used as separate components. A deformation of the walls, which are almost under the same pressure, is in this case also minimised by the low pressure difference of 50 Pa between the chambers, according to the invention, when the system is in operation.

[0016] The prevision in aligning the roller mills can be further increased by connecting the first and second fastening walls and/or the third and fourth fastening walls to each other mechanically in a stabilising manner.

[0017] According to the invention the object is further achieved in that several cooling rolls are secured in a common roller mill.

[0018] This dispenses on the one hand with the adjustment of separate roller mills for the cooling rolls, and on the other no geometric variations can occur between the guides for the individual cooling rolls.

[0019] In a further advantageous embodiment of the invention provision is made for the process chamber to be sealed with a cover wall which incorporate, in the region of the cooling rolls, openings which can each be sealed vacuum-tight by doors.

[0020] In a further design of the invention provision is made for the associated magnetron sputter sources, the magnetron surrounded by a cooling roll, to be secured to the doors, the doors to be fitted with a traversing gear, and for the cooling roll to be able to be moved away. This enables targets to be changed or maintenance work to be carried out, whilst the process roller mill is stationary, without having to remove the process chamber or the process roller mill. The invention will be explained in greater detail in the following with reference to an exemplary embodiment. In the associated drawings

[0021] Fig. 1 shows an explanatory representation of a vacuum coating system in longitudinal section, and

[0022] Fig. 2 shows a perspective exploded representation.

[0023] The vacuum coating system consists of a process chamber 1, a reel chamber 2, in which uncoiler 4 for the strip material 6 to be coated is installed, and a reel chamber 3 in which a coiler 5 is installed. Belt valves 7 and 8 are arranged between process chamber 1 and reel chambers 2 and 3, through which valves strip material 6 is guided.

[0024] In the exemplary embodiment the first reel chamber 2 is separated from process chamber 1 by a first common fastening wall 9 for both chambers. In reel chambers 2 and 3 there is a roller mill 11 and 12, which incorporates uncoiler 4 and coiler 5 and guide devices 13 for the material. In process chamber 1 there is a process roller mill 14, in which two cooling rolls 15 and 16, with the associated guide devices 13, are secured. For coating strip material 6 magnetron sputter sources 17 are arranged above the surface of cooling rolls 15 and 16. Uncoiling roller mill 11 is located at a first fastening point 18, in reel chamber 2, on the first common fastening wall 9. The second fastening point 19 is located on the same fastening wall 9 on the process chamber side.

[0025] The third fastening point 20 is also arranged in process chamber 1 on a second common fastening wall 10. Process roller mill 14 is positioned at the second and third fastening points 19 and 20. A second common fastening wall 10 separates process chamber 1 from the second reel chamber 3. On this fastening wall 10 the fourth fastening point 21 is located in reel chamber 3. Coiling roller mill 12 is secured at this point. Deformation of common fastening walls 9 and 10, and of fastening points 18, 19, 20 and 21, is reduced by the pressure difference of a maximum of 50 Pa between process chamber 1 and reel chamber 2 or 3.

[0026] Process chamber 1 is sealed by a cover wall 22 in which are provided openings 23 for doors 24. Doors 24 may be sealed vacuum tight. The magnetron environment, including the magnetrons 25 of a cooling roll 15 or 16, is secured to doors 24. Traversing gears 26, which enable doors 2 to be moved away from cooling roll 15 or 16 after opening, are mounted underneath doors 24.

LIST OF REFERENCES

1 Process chamber
2 Reel chamber (for the uncoiler)
3 Reel chamber (for the coiler)
4 Uncoiler
5 Coiler
6 Strip material
7 Belt valve
8 Belt valve
9 Fastening wall
10 Fastening wall
11 Roller mill
12 Roller mill
13 Guide device
14 Process roller mill
15 Cooling roll
16 Cooling roll
17 Magnetron sputter source
18 First fastening point
19 Second fastening point
20 Third fastening point
21 Fourth fastening point
22 Cover wall
23 Opening
24 Doors
25 Magnetron environment with magnetron sputter sources
26 Traversing gear

CLAIMS

1. A vacuum coating system for coating strip material in process chambers, in which, in a first evacuable reel chamber, an uncoiling device, with an inserted uncoiler for the strip material to be coated, is arranged in a first roller mill, and where in a second evacuable reel chamber, a coiling device with a removable cooler for the coated material is arranged in a second roller mill, between which the strip material to be coated runs through an evacuable process chamber, wherein a process roller mill, with guide devices for the strip material and at least one cooling roll, is arranged in each process chamber, above the surface of which cooling roll is arranged at least one magnetron sputter source, characterised in that the roller mill (11) for the uncoiler (4) is secured at a first fastening point (18) in the first reel chamber (2), the process roller mill (14) is secured at a second and third fastening point (19; 20) in the process chamber (1), and the roller mill (12) for the coiler (4) is secured at a fourth fastening point (21) in the second reel chamber (2), and in that when the system is operating a pressure difference between a reel chamber (2; 3) and the process chamber (1) is a maximum of 50 Pa.

2. The vacuum coating system according to Claim 1, characterised in that the first and second fastening points (18; 19) lie on both sides of a common fastening wall (9).

3. The vacuum coating system according to Claim 1 or 2, characterised in that the third and fourth fastening points (20; 21) lie on both sides of a common fastening wall (10).

4. The vacuum coating system according to Claim 1, characterised in that the first fastening point (18) lies in the first reel chamber (2) on a first fastening wall, and the second fastening point (19) lies in the process chamber (1) on a second fastening wall.

5. The vacuum coating system according to Claim 1 or 4, characterised in that the third fastening point (20) lies in the process chamber (1) on a third fastening wall, and the fourth fastening point (21) lies in the second reel chamber (3) on a fourth fastening wall.

6. The vacuum coating system according to Claim 4 or 5, characterised in that the first and second fastening wall and/or the third and fourth fastening wall are connected mechanically to each other in a stabilising manner.

7. The vacuum coating system for coating strip material in process chambers, process chambers, in which, in a first evacuable reel chamber, an uncoiling device, with an inserted uncoiler for the strip material to be coated, is arranged in a first roller mill, and where in a second evacuable reel chamber, and a coiling device with a removable cooler for the coated material is arranged in a second roller mill, between which the strip material to be coated runs through at least one evacuable process chamber, wherein a process roller mill, with guide devices for the strip material and a at least one cooling roll, is arranged in each process chamber, above the surface of which cooling roll is arranged at least one magnetron sputter source, characterised in that the several cooling rolls (15; 16) are secured in a common process roller mill (14).

8. The vacuum coating system according to Claim 7, characterised in that the process chamber (1) is sealed with a cover wall (22) which, in the region of the cooling rolls (15; 16), incorporates openings (23) which can each be sealed vacuum tight by doors (24).

9. The vacuum coating system according to Claim 7 and 8, characterised in that the associated magnetron sputter sources with the magnetron environment (25) are secured to the doors (24), the doors (24) are provided with a traversing gear (26)and can be moved away from the cooling roll (15; 16).

Attached 2 pages of drawings